

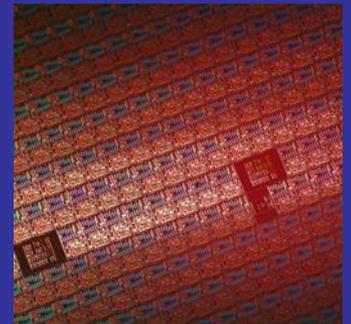


Accelerating the next technology revolution

2011 International Symposium on Extreme Ultraviolet Lithography October 17-19 Miami, FL

- Closing Address
- 2012 EUVL Symposium Announcement

Stefan Wurm, SEMATECH
Kurt Ronse, imec

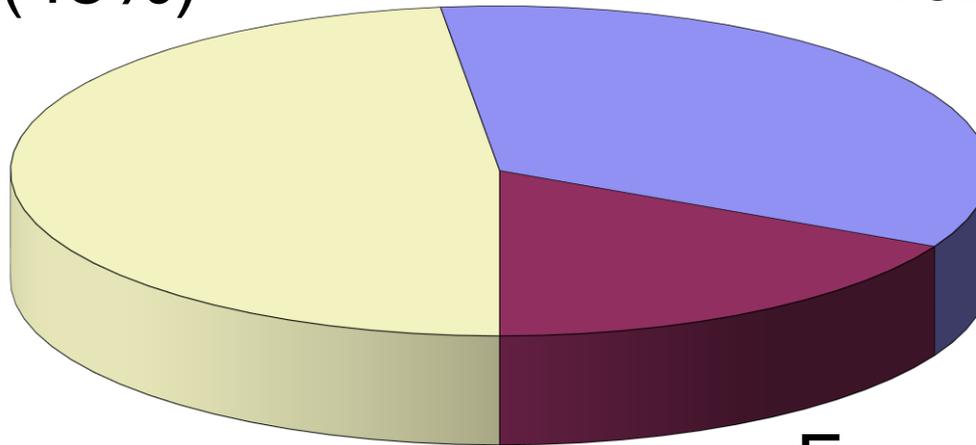


Attendance by Geographic Region



United States
175 (48%)

Asia / Pacific
132 (35%)



Europe
64 (17%)

- 372 registered





10th International Program Steering
Committee Meeting
Miami, FL
October 19, 2011



EUV Focus Areas 2006-2010: 22 nm half-pitch insertion target



2006 / 32hp	2007 / 22hp	2008 / 22hp	2009 / 22hp	2010 / 22hp
1. Reliable high power source & collector module	1. Reliable high power source & collector module	1. Long-term source operation with 100 W at IF and 5MJ/day	1. Mask yield & defect inspection/review infrastructure	1. Mask yield & defect inspection/review infrastructure
2. Resist resolution, sensitivity & LER met simultaneously	2. Resist resolution, sensitivity & LER met simultaneously	2. Defect free masks through lifecycle & inspection/review infrastructure	2. Long-term reliable source operation with 200 W at IF	1. Long-term reliable source operation with 200 W at IF
3. Availability of defect free mask	3. Availability of defect free mask	3. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously	2. Resist resolution, sensitivity & LER met simultaneously
4. Reticle protection during storage, handling and use	4. Reticle protection during storage, handling and use	• Reticle protection during storage, handling and use	• EUVL manufacturing integration	• EUVL manufacturing integration
5. Projection and illuminator optics quality & lifetime	5. Projection and illuminator optics quality & lifetime	• Projection / illuminator optics and mask lifetime		

EUVL pilot line insertion in 2011/12 and HVM introduction in 2013

EUV Symposium Steering Committee Observations - Source



- Six EUV scanners have been shipped and pilot line ramp-up has started. However, EUV scanner productivity is significantly lower than expected.
- Scanner and source suppliers must solve the scanner source productivity challenge or EUV HVM introduction will be delayed (from 2013 to 2014/15?)
 - Source roadmaps for achieving 60 wph for pilot line and 100 wph for HVM cannot shift again
- No EUV scanner has yet operated anywhere close to 200-250W power (now < 10W in the field) & new problems may surface once the system is stressed at HVM power levels
- Source technology scalability to >> 250W remains a big question mark

EUV Symposium Steering Committee Observations - Mask



- Availability of yielding masks / mask blanks to support pilot line and HVM introduction remains a major concern
 - Defect levels have improved and are likely to support DRAM requirements at a level that will support pilot line operation soon
 - Logic and foundry mask defect requirements are much more stringent and order of magnitude improvements are needed over the next two years to support a 2014/15 logic/foundry pilot line start
 - IC manufacturers are working on practical defect mitigation schemes to be able to work with a few defects per mask
- The industry has put programs in place that will close the EUV mask infrastructure tool gaps by 2014/15
- Industry solutions for defect & contamination free reticle handling, storage, and use need to be agreed and implemented
 - Dual-pod pod and mask handling requires attention and further resolution through consensus building and data sharing

EUV Symposium Steering Committee Observations - Resist



- Resists with ≤ 22 nm hp resolution demonstrated on MET's and NXE:3100:
 - Production resists may not meet the 10 mJ/cm² requirement
 - Post processing may be sufficient to reduce LER to levels that will enable DRAM pilot but not logic/foundry requirements
 - Outgas testing for NXE:3100/3300 qualification is now available
- Several sub-20 nm resolving resists have been demonstrated (CAR and inorganic materials) and nanoparticle engineered resists demonstrate mid-20 nm resolution at very good sensitivity
- Resist materials research needs to firmly focus on the < 16 nm half-pitch nodes to support the ITRS roadmap

2011 EUV Focus Areas



Key Focus Areas	Rank* (StdDev)
Long-term reliable source operation with 200 W at IF	1.0 (0.00)
Mask yield & defect inspection/review infrastructure	2.0 (0.46)
Resist resolution, sensitivity & LER met simultaneously	3.0 (0.50)
EUVL manufacturing integration	Not ranked

Source has been ranked as the #1 concern by all steering committee members.

*) Average of 27 steering committee member votes

EUV Focus Areas 2006-2010: 22 nm half-pitch insertion target



2007 / 22hp	2008 / 22hp	2009 / 22hp	2010 / 22hp	2011 / 22hp
1. Reliable high power source & collector module	1. Long-term source operation with 100 W at IF and 5MJ/day	1. Mask yield & defect inspection/review infrastructure	1. Mask yield & defect inspection/review infrastructure	1. Long-term reliable source operation with 200 W at IF*
2. Resist resolution, sensitivity & LER met simultaneously	2. Defect free masks through lifecycle & inspection/review infrastructure	2. Long-term reliable source operation with 200 W at IF	1. Long-term reliable source operation with 200 W at IF	2. Mask yield & defect inspection/review infrastructure
3. Availability of defect free mask	3. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously	2. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously
4. Reticle protection during storage, handling and use	• Reticle protection during storage, handling and use	• EUVL manufacturing integration	• EUVL manufacturing integration	• EUVL manufacturing integration
5. Projection and illuminator optics quality & lifetime	• Projection / illuminator optics and mask lifetime			

*) This requires a 20 X improvement from current source power status



HVM introduction in late 2013 if productivity challenge can be met



ANNOUNCEMENT OF
EUVL-LE SYMPOSIUM 2012

ANNOUNCEMENT 1
19 OCTOBER 2011



DATE AND ORGANIZATION

The next EUVL-LE symposium will be held in Europe :

Sun 30 Sept. 2012 – Fri 5 October 2012

Organized by imec and Sematech, in cooperation with EIDEC

Chairs : Kurt Ronse / Geert Vandenberghe



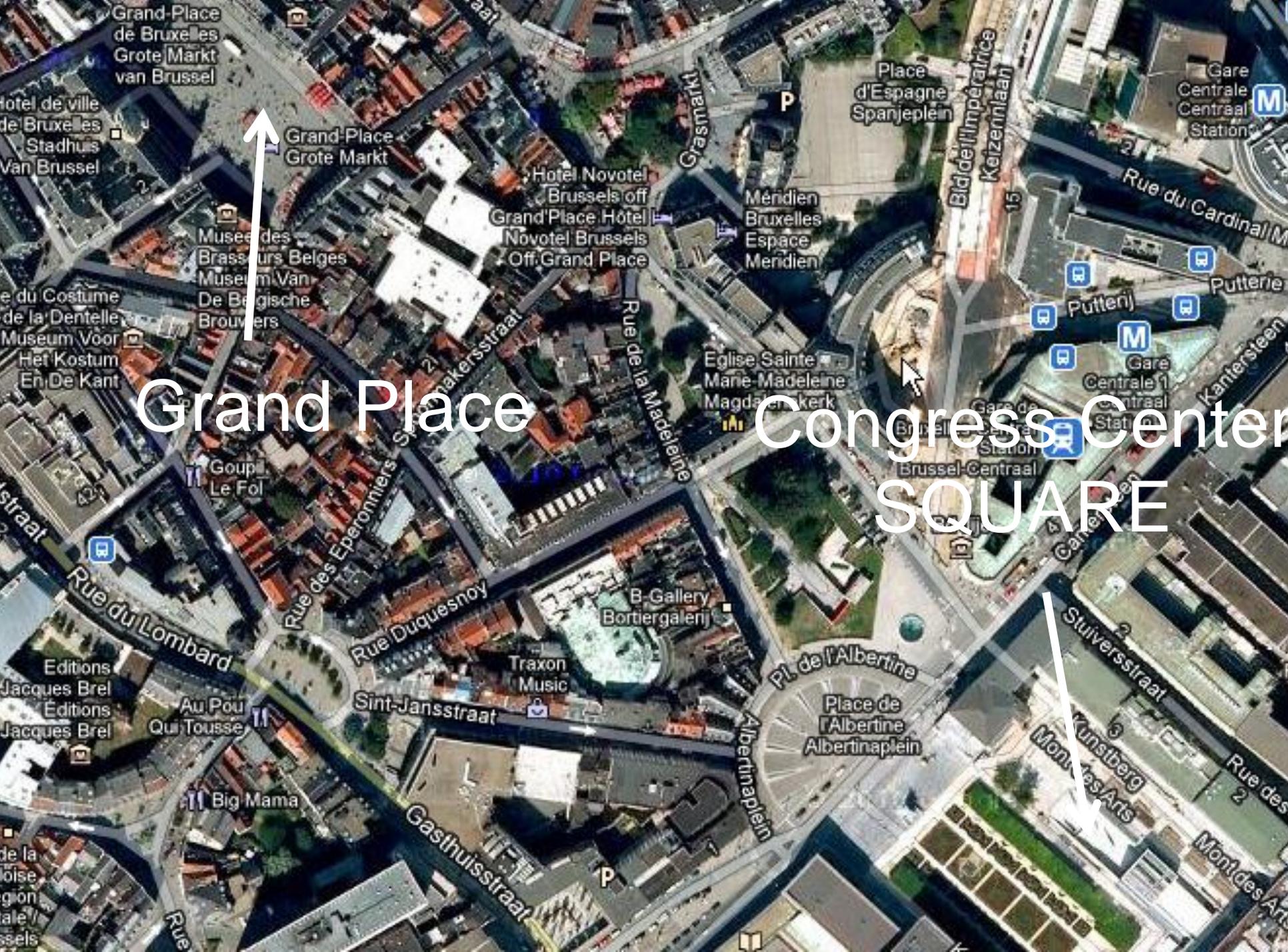
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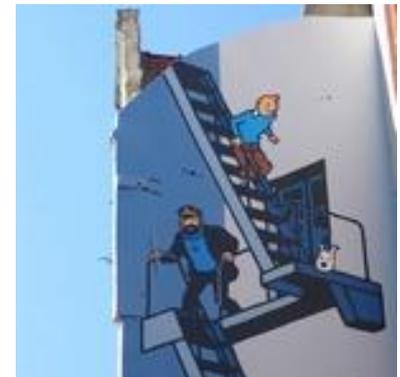
How to reach ?

- ▶ Brussels connected with all major European airports by multiple 1-2 hour flights or high-speed trains per day
 - Amsterdam Schiphol (Netherlands)
 - London Heathrow (UK)
 - Frankfurt, Munich (Germany)
 - Paris Charles De Gaulle (France)
 - Madrid (Spain)
 - ...

- ▶ Trains every 20 minutes connect Brussels International Airport to downtown Brussels

MARK YOUR CALENDARS !!!

► 30 September - 5 October, 2012



► See you all in Brussels next year

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**ASPIRE
INVENT
ACHIEVE**

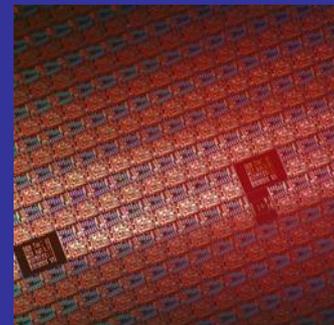


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Thank you





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- Program Committee:
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 - Frank Goodwin, Winfried Kaiser, Iwao Nishiyama
- All paper/poster presenters
- Steering Committee & Session Chairs
- Audio Visual
 - Jeff and Rich
- Logistics and Symposium Support:
 - Beverly, Jill, and Marcy





Thank You!